

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-V • EXAMINATION – SUMMER • 2014

Subject Code: 150902

Date: 13-06-2014

Subject Name: Power System Analysis and Simulation

Time: 10.30 am - 01.00 pm

Total Marks: 70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

Q.1

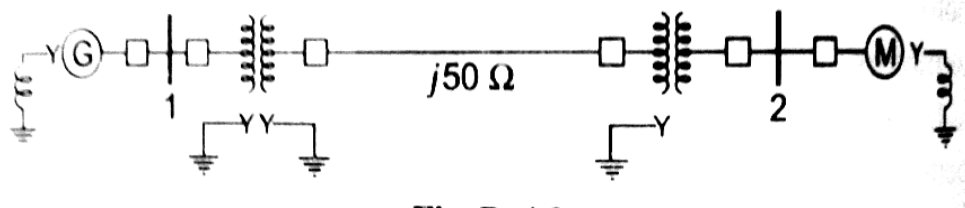
- (a) A 3-phase overhead transmission line delivers a load of 80 MW at 0.8 pf lagging and 220 kV between the lines. Its total series impedance per phase and shunt admittance per phase is $200 \angle 80^\circ$ ohms and $0.0013 \angle 90^\circ$ mhos per phase respectively. Using nominal T method determine (i) A,B,C,D constants of the line (ii) Sending end voltage (iii) Sending end current (iv) Sending end power factor (v) Transmission efficiency of the line (7)
- (b) Prove that for a fully transposed line, the zero sequence impedance is much higher than positive or negative sequence impedance (7)

Q.2

- (a) A three phase synchronous generator is initially operating on load. Suddenly a line to ground fault occurs at one of its terminals. Derive the expression for fault current and phase voltages. (7)
- (b) What is neutral earthing? Explain resonant earthing system (7)
- OR
- (b) A transmission line having a surge impedance of 'Z' ohms is terminated through a resistance R. Derive the expression for co-efficient of reflection and refraction for (i) Voltage waves (ii) Current waves (7)

Q.3

- (a) State the advantages of per unit system (6)
- (b) Draw the p.u. impedance diagram for the power system shown in fig. Neglect resistance and use a base of 100 MVA, 220 kV in the 50Ω line. The ratings of generator, motor and transformers are: (8)

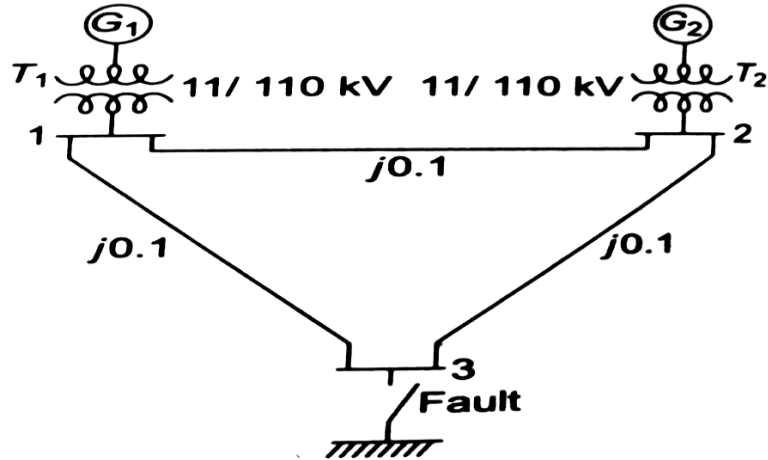


Generator : 40 MVA, 25 kV, $X'' = 20\%$
Motor : 50 MVA, 11 kV, $X'' = 30\%$
Y-Y transformer : 40 MVA, 33/220 kV, $X = 15\%$
Y- Δ transformer : 30 MVA, 220/11 kV, $X = 15\%$
Choose a base of 100 MVA, 33 kV in generator circuit

OR

Q.3

- (a) Consider the three bus system shown in fig. The generators are 100 MVA, with a transient reactance of 10% each. Both the transformers are 100 MVA with a leakage reactance of 5%. The reactance of each of the lines to a base of 100 MVA, 110 kV is 10%. Obtain the value of fault current for a three phase solid short circuit on bus 3. Assume prefault voltages to be 1.0 p.u. and prefault currents to be zero (7)



- (b) Write a short note on selection of circuit breakers (7)

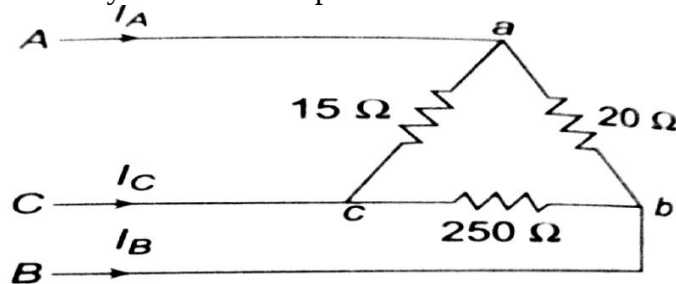
Q.4

- (a) Using rigorous solution method obtain the value of A,B,C,D constant for long transmission Line (7)
- (b) A 275 kV transmission line has the following line constants: $A = 0.85 \angle 5^\circ$, $200 \angle 75^\circ$ (7)
- (i) Determine the power at unity power factor that can be received, if the voltage profile at each end is to be maintained at 275 kV (b) What type of compensation equipment would be required if the load is 150 MW at unity pf with the same voltage profile as in part (i)

OR

Q.4

- (a) Draw the zero sequence networks for different types of transformer connections (7)
- (b) An unbalanced delta connected load is connected across a balanced three phase supply of 400 V as shown in fig. Find the symmetrical components of line currents and delta currents (7)



Q.5

- (a) What is Corona? State the advantages and disadvantages of corona? Also explain how corona effects can be mitigated. (7)
- (b) Derive the equation for attenuation of a travelling wave. (7)

OR

Q.5

- (a) A 500 kV, 2μS, rectangular surge travels along the line which is terminated by a capacitance of 2500 pF. Determine the voltage across the capacitance and the reflected voltage wave if the surge impedance is 400Ω (4)
- (b) A synchronous generator is rated at 25 MVA, 11 kV. It is star connected with neutral point solidly grounded. The generator is operating on no-load at rated voltage. Its reactances are $X'' = X_2 = 0.2$ pu and $X_0 = 0.08$ pu. Calculate the symmetrical subtransient currents for (i) LG fault (ii) LL fault (iii) LLG fault (iv) LLL fault. After calculating the values of fault currents do you find something surprising in the values of fault currents for LG and LLL faults? Why? (10)
